NORTH AFRICA, MIDDLE EAST AND WESTERN EURASIA

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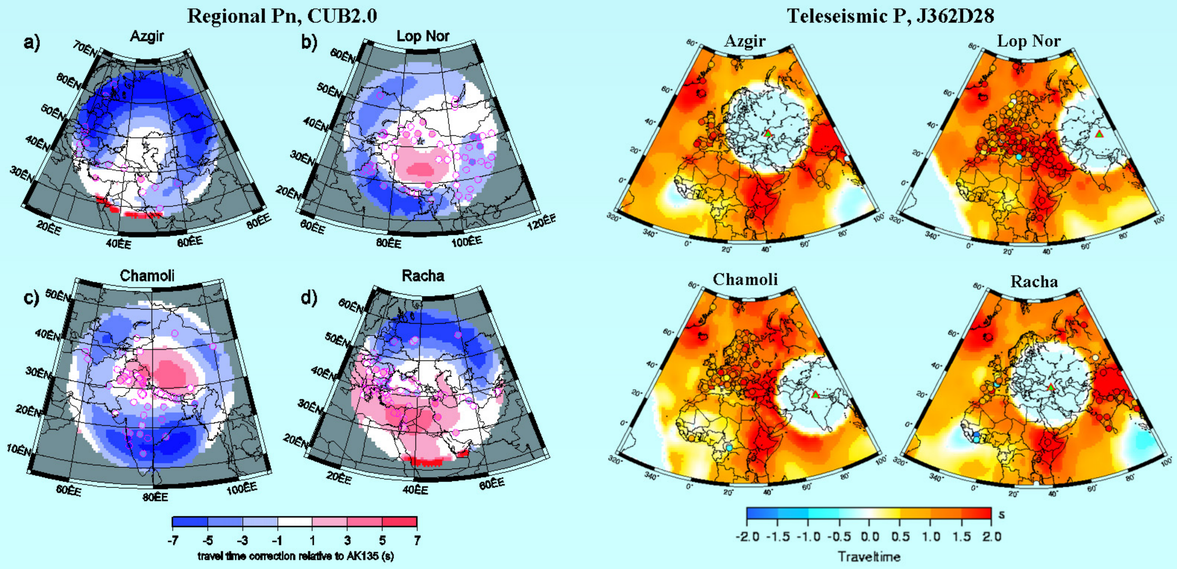
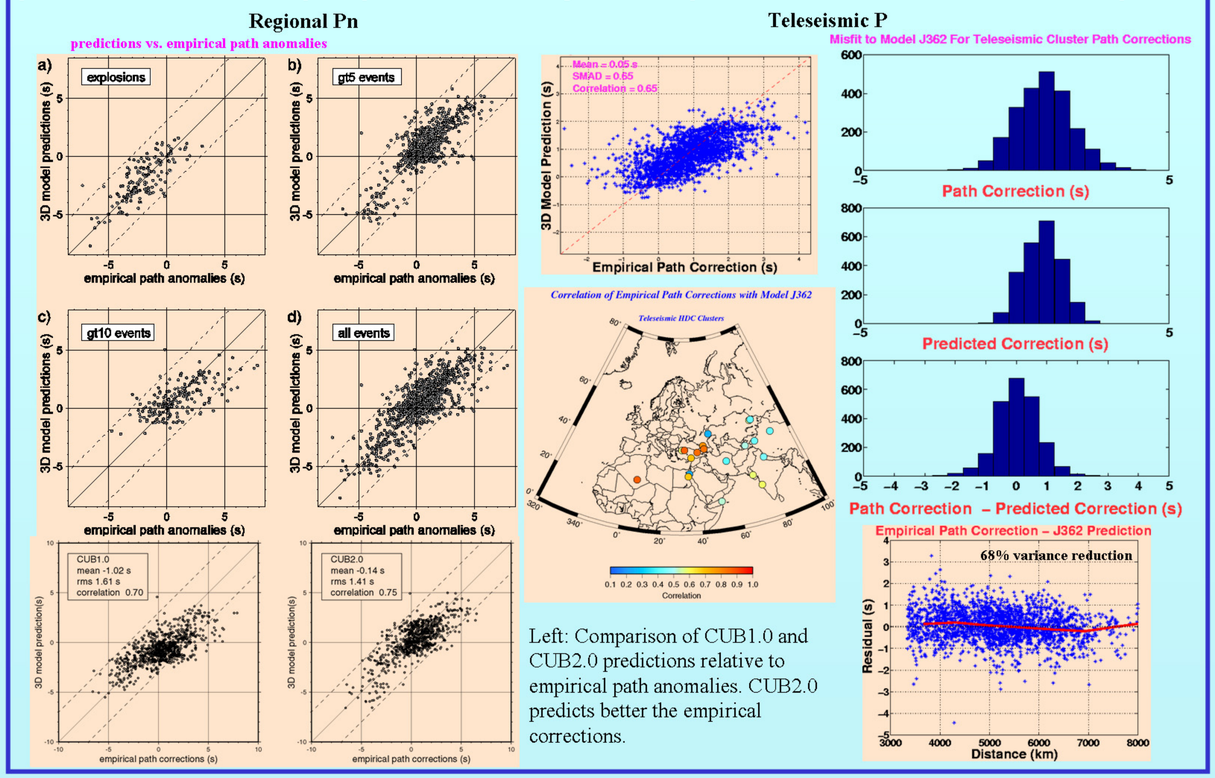
Model validation

Models are validated by comparing model predictions of correction surfaces to empirical path anomalies obtained from event cluster analysis. Pn correction surfaces from CUB2.0 and teleseismic P corrections from J362D28 are shown below for event clusters in Azgir, Lop Nor, Chamoli and Racha. Empirical path correction are plotted as symbols, using the same color scheme as that of the model predictions.



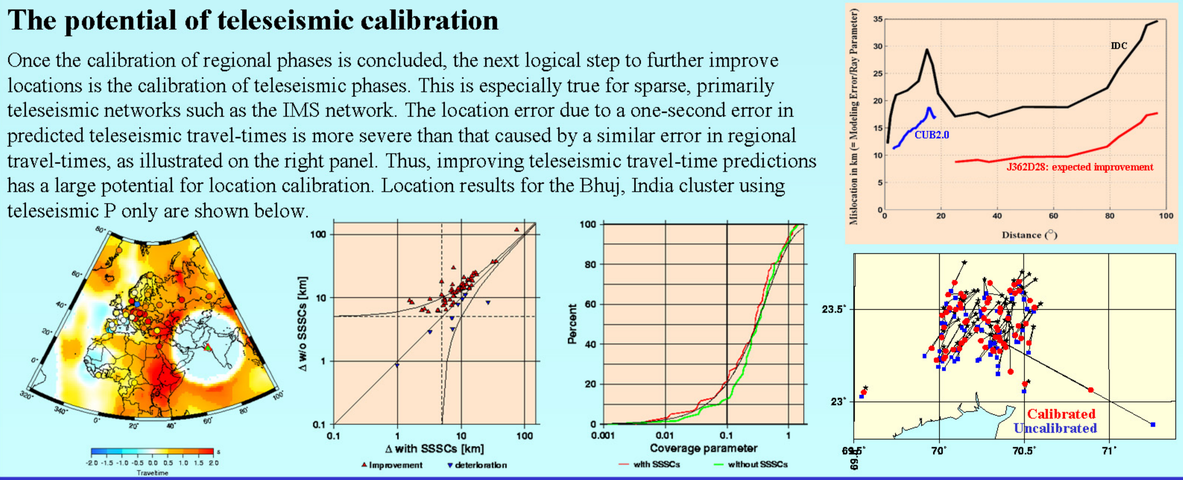
We quantify the goodness of fit by the correlation between model predictions and empirical path corrections. Both the CUB2.0 and J362D28 predictions correlate well with empirical path anomalies. The range of J362D28 predictions is somewhat smaller than that of the empiricals.



Left: Comparison of CUB1.0 and CUB2.0 predictions relative to empirical path anomalies. CUB2.0 predicts better the empirical corrections.

The potential of teleseismic calibration

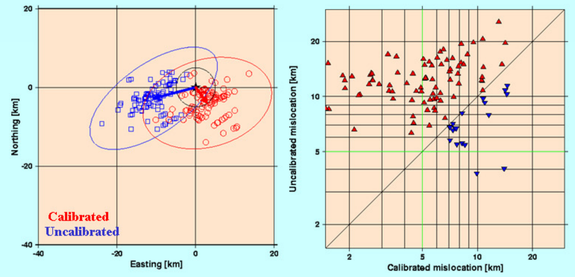
Once the calibration of regional phases is concluded, the next logical step to further improve locations is the calibration of teleseismic phases. This is especially true for sparse, primarily teleseismic networks such as the IMS network. The location error due to a one-second error in predicted teleseismic travel-times is more severe than that caused by a similar error in regional travel-times, as illustrated on the right panel. Thus, improving teleseismic travel-time predictions has a large potential for location calibration. Location results for the Bhuj, India cluster using teleseismic P only are shown below.



Novel approaches for validating calibrated travel-times

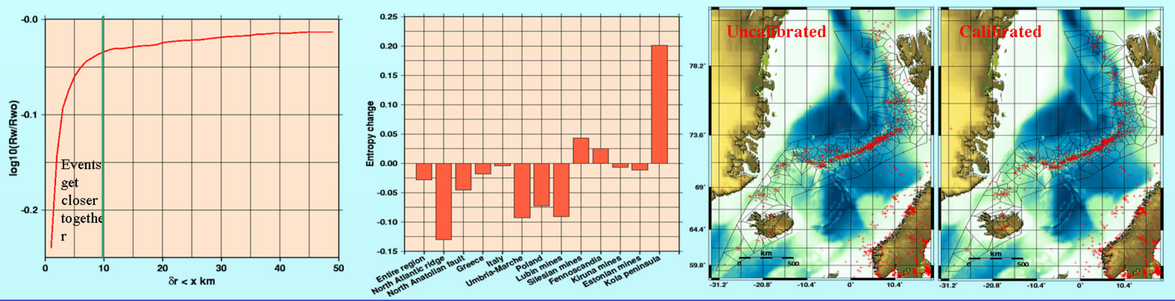
Simulated sparse network bulletins

Many reference events are recorded by hundreds of stations. To increase the statistical power to demonstrate improvements we generate bulletins from well-recorded events by taking subsets of stations. These sparse network bulletins allow better estimations of location bias, mislocation and uncertainties. The right panel shows the relocations of a GT5 earthquake from the Hoceima, Morocco cluster using Pn and Sn from network configurations of only 6-10 stations with gap<130° and sgap<160°.



Seismicity pattern

Despite the Consortium effort, vast areas are still not covered by reference events. We relocated the entire GSETT-3 bulletin in the study region to test the hypothesis that the scatter in seismicity decreases due to calibrated travel-times. We quantify the scatter in seismicity by the entropy and the ratio of the distance of nearest natural neighbors of calibrated and uncalibrated locations. The entropy indeed decreases, i.e. the seismicity gets tighter, in most regions when regional SSSCs are applied. The right panel shows the locations of Mid-Atlantic ridge events without and with SSSCs. Although there is no ground truth available in this region we may conclude that events align better on the ridge when calibrated travel-times are employed.



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